

# (12) UK Patent Application (19) GB (11) 2 348 777 (13) A

(43) Date of A Publication 11.10.2000

(21) Application No 9907664.8

(22) Date of Filing 06.04.1999

(71) Applicant(s)

**Motorola Limited**  
(Incorporated in the United Kingdom)  
Jays Close, Viables Industrial Estate, BASINGSTOKE,  
Hampshire, RG22 4PD, United Kingdom

(72) Inventor(s)

**Paul Dominic Baker**  
**William Robinson**  
**John Hughes**

(74) Agent and/or Address for Service

**Marc Morgan**  
**Motorola Limited, European Intellectual Property**  
**Department, Midpoint, Alencon Link, BASINGSTOKE,**  
**Hampshire, RG21 7PL, United Kingdom**

(51) INT CL<sup>7</sup>

**H04Q 7/38 7/22**

(52) UK CL (Edition R )

**H4L LDPP L1H10**

(56) Documents Cited

**EP 0810803 A2 WO 98/59506 A2 WO 98/20698 A2**  
**WO 96/07110 A1 WO 95/24809 A1 US 5678194 A**

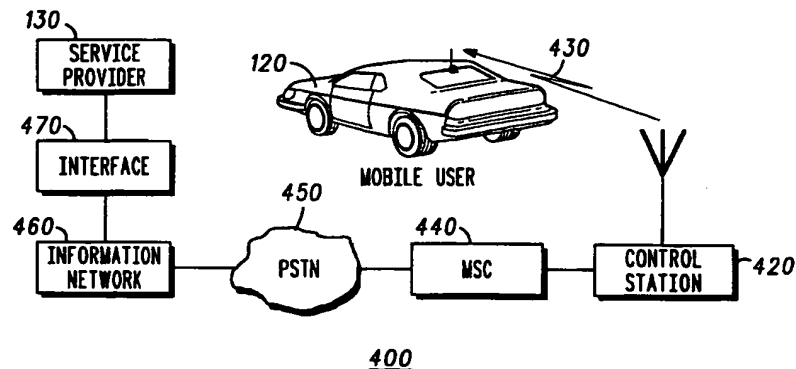
(58) Field of Search

**UK CL (Edition Q ) H4L LDPP LDRRS LDSHE LDSHX**  
**LDSL LDSM LDSY LERM**  
**INT CL<sup>6</sup> H04M 11/08 , H04Q 7/22 7/38**  
**ONLINE: WPI**

(54) Abstract Title

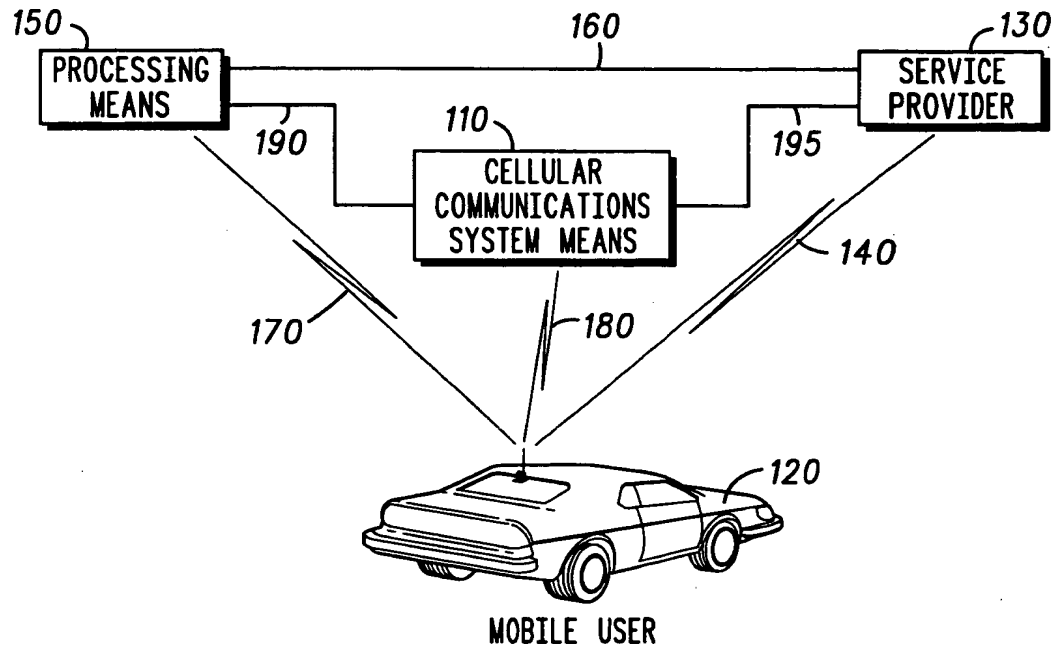
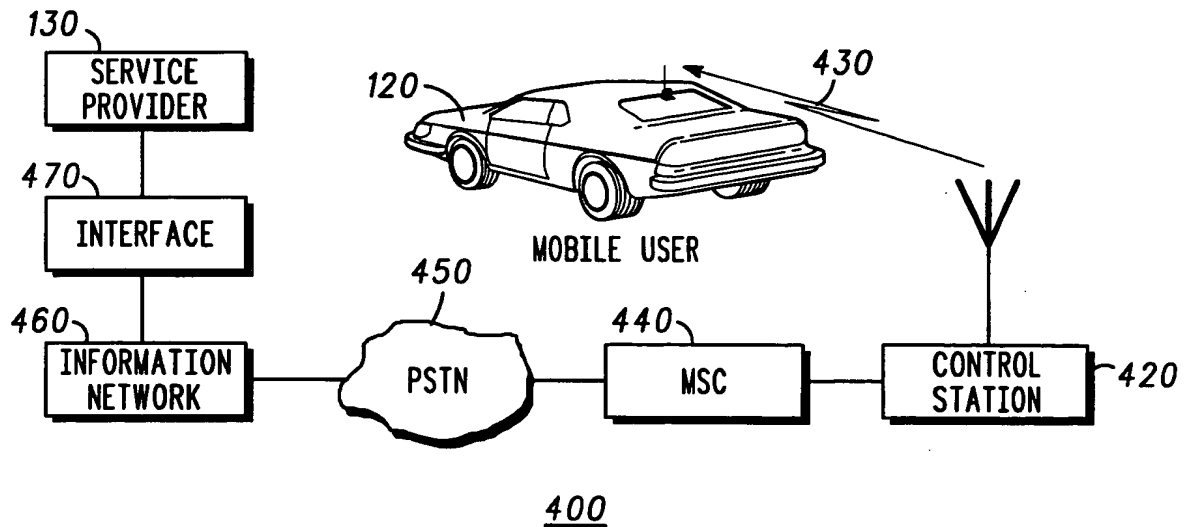
**Selective service provision based on user location and movement**

(57) The invention provides improved selectivity in the provision or receipt of a service via a cellular communication system, for example, where an information service provider 130 only wishes to advertise a retail outlet to mobile users 120 in a specific area or travelling along a specific route or where a mobile user 120 only wishes to receive a location specific service, the invention determines provision or receipt of the service based on a location parameter related to the location of the mobile user 120, a movement parameter related to the movement of the mobile user 120 and a distribution parameter related to an area in which the service provider 130 wishes to provide service. Processing means (150, fig.1) are provided, preferably located at a MSC 440, having input means for receiving data related to the location of the user 120, the movement of the user 120 and the distribution area of the service provider 130, comparing means for comparing the input data and output means for outputting data related to the comparison result. The movement parameter may define, measure, calculate or estimate one or more aspects of movement of the user 120 e.g. direction, speed or functions thereof, and may be determined from the location history of the present or previous journeys or from predetermined route data. The service provided may be the supply of software for downloading by the user 120 or information services, such as news bulletins, travel routes, tourist advice, details of retail outlets or advertisements. The cellular system may be a cellular radio systems such as GSM, UMTS and may be connected to an information network 460, such as the Internet, a restricted access network or a private network.



**FIG. 4**

**THIS PAGE BLANK (USPTO)**

*FIG. 1**FIG. 4*

**THIS PAGE BLANK (USPTO)**

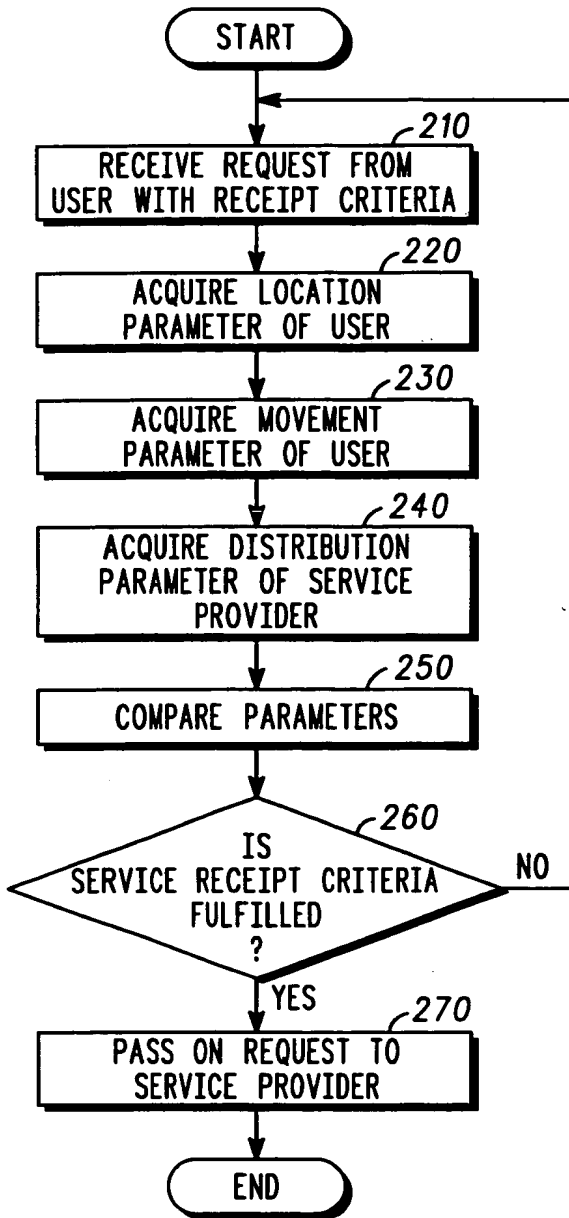


FIG. 2

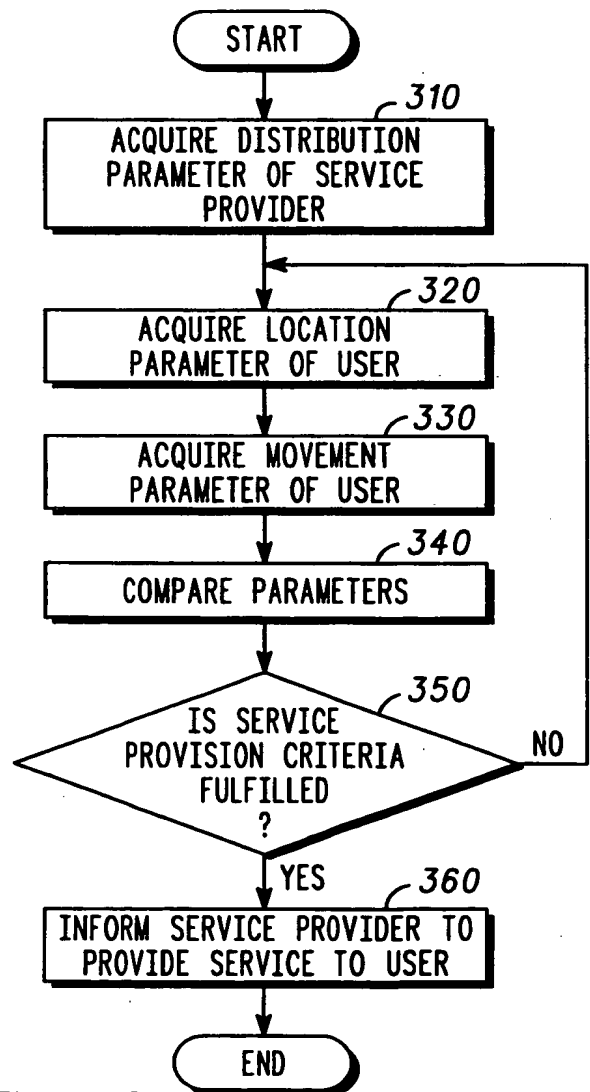


FIG. 3

**THIS PAGE BLANK (USPTO)**

SERVICE VIA A CELLULAR COMMUNICATIONS SYSTEMField of the Invention

5 The present invention relates to provision and/or receipt of a service,  
particularly an information service, via a cellular communications system. The  
present invention is applicable to, but not limited to, cellular radio  
communication systems such as the Global System for Mobile communications  
(GSM) and the Universal Mobile Telecommunication System (UMTS), the latter  
10 being currently under standardisation.

Background of the Invention

One type of communications system is a cellular communications system. In a  
15 cellular communications system, the area over which service is provided is  
divided into a number of smaller areas called cells. Typically each cell is served  
from a base transceiver station (BTS) which has a corresponding antenna or  
antennas for transmission to and reception from a user station, normally a  
mobile station. Presently established cellular radio communications systems  
20 include GSM systems (Global System for Mobile Communications).

In well known fashion, such cellular communications system provide a  
communications link for telephone calls, for communicating voice and/or data  
in a two-way manner from and to a user of the system, which user can  
25 optionally be a mobile user. Additionally, such cellular communications systems  
can be used as a communications link through which a service provider  
provides a service to a user, for example a mobile user. Such services include  
information services. A few examples of the many types of information that can  
be provided are news bulletins, travel routes, tourist advice, details of retail or  
30 entertainment outlets, advertisements and so on. One example of a service  
other than information services that can be envisaged is supply of software for  
downloading by the user.

It is expected that increasing amounts or increasing intricacy of information or other services will desirably be provided as improvements are made to cellular communications systems. This will include increasing provision and  
5 transmission of information and other services in multi-media form. In this respect the Universal Mobile Telecommunication System (UMTS) currently under standardisation is intended to provide a harmonised standard under which cellular radio communication systems will provide communications links suitable for transmitting a variety of services such as information services as  
10 described above. It is expected that within the framework of developments such as UMTS or the like, there will be substantial increases in the number of different services that service providers will wish to provide to mobile users.

Generally speaking, the above described combination of information provision  
15 services and cellular radio communications systems along the lines of UMTS creates a broad range of new engineering problems and challenges. Indeed, one of the challenges faced is to envisage what new opportunities arise to provide users with additional facilities in the light of such a combination.

20

### Summary of the Invention

In the light of the above the present inventors have envisaged that ever increasing numbers of services and service providers will become available for  
25 possible use by mobile users, and have particularly envisaged that there will be an increasing need for novel ways in which a user can control and optimise the numbers of such services which he should avail himself of, in other words by improvement of selectivity. Similarly, the present inventors have envisaged there will be an increasing desire for service providers to refine the choice of  
30 which users they provide their service to.

---



The present inventors have further envisaged that the above aspects of improved selectivity, by user and/or service provider, would be enhanced by introducing a dependency upon the location and movement of the user.

5

The present invention advantageously implements means for the service provider and end user to take advantage of the characteristics described above and envisaged by the present inventors.

10 According to one aspect of the present invention, there is provided a method of determining provision of a service via a cellular communications system, as claimed in claim 1.

15 According to another aspect of the present invention, there is provided a method of determining receipt of a service via a cellular communications system, as claimed in claim 2.

20 According to another aspect of the invention, there is provided an apparatus for determining provision of a service via a cellular communications system, as claimed in claim 9.

25 According to another aspect of the invention, there is provided an apparatus for determining receipt of a service via a cellular communications system, as claimed in claim 10.

According to another aspect of the invention, there is provided a processing means, as claimed in claim 17.

Further aspects of the invention are as claimed in the dependent claims.

30

The present invention advantageously provides improved selectivity to users and/or service providers based on a mobile user's location and movement as inter-related to an area in which a service provider wishes to provide his service.

- 5 Additional specific advantages are apparent from the following description and figures.

#### Brief Description of the Drawings

10

Fig. 1 is a schematic representation of logical interfaces, linkages, and divisions of functions of an embodiment of the present invention.

Fig. 2 is a process flow chart of an embodiment of the present invention.

15

Fig. 3 is a process flow chart of an embodiment of the present invention.

Fig. 4 is a schematic illustration of a communications system in accordance with the present invention.

20

#### Description of an Embodiment of the Invention

One particular embodiment of the invention is now described by way of example only. Fig. 1 shows, in the form of a schematic illustration, the interfaces and interconnections of an overall arrangement of the present embodiment. Cellular communications system means 110 represent appropriate control and management functions of a cellular communications system, via which system a user, in this case a mobile user 120, can communicate in known fashion.

30

---

Fig. 1 also shows service provider 130, which in the present embodiment provides information such as news bulletins, travel routes, tourist advice, details of retail or entertainment outlets, advertisements and so on.

- 5 Fig. 1 also shows processing means 150, which in the present embodiment are used in a process of determining whether provision of the service (from the point of view of service provider 130) and/or receipt of the service (from the point of view of mobile user 120) is desirable.
- 10 Various different logical links between the above described entities will now be described, in the sense that definition of such logical links serves to indicate the flow of respective different types of information as employed in the invention, but it is to be appreciated that the different logical links will to lesser or greater extent share common communications infrastructure links such as radio links
- 15 between mobile user 120 and for example a base transceiver station (BTS) of the cellular communications system.

In the present embodiment, the different logical links, as shown in Fig. 1, are as follows.

- 20 Should provision of an information service from service provider 130 to be received by mobile user 120 take place, it will do so along a communications link shown schematically as item 140, hereinafter referred to as service provider/mobile user link 140. As part of the above mentioned process of
- 25 determining whether provision of the service (from the point of view of service provider 130) and/or receipt of the service (from the point of view of mobile user 120) is desirable, information is passed to and fro between service provider 130 and processing means 150 along a communications link shown
- 30 schematically as item 160, hereinafter referred to as service provider/processing means link 160. Information is passed to and fro between mobile user 120 and

processing means 150 along a communications link shown schematically as item 170, hereinafter referred to as mobile user/processing means link 170.

Information is passed to and fro between mobile user 120 and cellular communications system means 110 along a communications link shown

5 schematically as item 180, hereinafter referred to as mobile user/system means link 180. Information is passed to and fro between processing means 150 and cellular communications system means 110 along a communications link shown schematically as item 190, hereinafter referred to as processing means/system means link 190. Information is passed to and fro between service provider 130  
10 and cellular communications system means 110 along a communications link shown schematically as item 195, hereinafter referred to as service provider/system means link 195.

The present embodiment employs a location parameter related to the location of  
15 the user, a movement parameter related to the movement of the user, and a distribution parameter related to an area in which the service provider wishes to provide the service.

The location parameter is a parameter that defines, measures, calculates or  
20 estimates, to an appropriate degree of accuracy, the geographical location of the user at a specific time. The location can be defined in absolute terms, or relative to an aspect of the cellular communications system, or relative to a location of the service provider. Hence it will be understood that the expression  
"parameter" extends to "function" where applicable.

25

The movement parameter is a parameter that defines, measures, calculates or  
estimates, to an appropriate degree of accuracy, one or more aspects of the  
movement of the user. The movement parameter can consist of a linear  
direction, or can be a direction based function, or a speed, or a speed based  
30 function, or a combined function of direction and speed, or any other

appropriate characteristic. Hence it will be understood that the expression “parameter” extends to “function” where applicable.

In the present embodiment both the location parameter and the movement  
5 parameter are derived by the cellular communications systems means 110 and then communicated to processing means 150 via processing means/system means link 190. The parameters can be derived in a number of possible ways. In the case of the location parameter one way is for signal strengths detected at different BTSs within the system from the mobile user to be analysed and  
10 compared to provide an estimate of the location of the mobile user. Another way is for triangulation to be used. The format of the parameter will depend on the characteristics of the cellular system to which the invention is being applied and also the method chosen to determine the location parameter. In the case of the movement parameter, one way is to calculate a number of further locations  
15 immediately after the initial location is determined and estimate therefrom the movement characteristic. In other words the movement parameter is determined at least from data related to the location of the user in a time after the location parameter is established. Another way is to use data related to previous locations of a current journey of the user, i.e. location history. Such  
20 data may be stored regularly by the communications system at all times, or it can preferably be stored primarily when a mobile user is detected as either approaching or being in the vicinity of service provider distribution areas of which the cellular communications system means 110 or processing means 150 are aware. Another way is to instead or in addition employ data related to  
25 locations of a previous journey of the user, such data being stored for example by cellular communications system means 110 or processing means 150. Yet another way is to instead or in addition employ data related to predetermined routes. The predetermined routes can be ones stored specifically for the particular mobile user, or can be general routes known to be commonly

followed by mobile users, including optionally as a function of time of day or day of week and so on.

Also, instead of being derived by system means, one or both of the location  
5 parameter and movement parameter can be derived by the mobile unit of the mobile user. One possible way is by means of global positioning system (GPS) means within a handset or other user terminal. A single location parameter can be derived from a single global positioning reading. Consecutive or continuous readings can be processed to provide the movement parameter. The resulting  
10 parameter or parameters is transmitted to processing means 150 via mobile user/processing means link 170.

Another possibility is that original data along the lines described above is gathered in some suitable fashion and separately communicated to processing  
15 means 150 which itself determines the location parameter and/or the movement parameter.

Whichever of the above options is implemented, processing means 150 require some form of input means for receiving data related to the location and  
20 movement of user 120.

The present embodiment also employs a distribution parameter, which is a parameter related to or indicating an area in which service provider 130 wishes to provide the service. The distribution parameter serves to define to a degree  
25 the area where the service provider considers it worthwhile or relevant for a user located therein to receive the service. For example, in the case where the service provided consists of information, including advertising, about a restaurant in a centre of a town, the service provider may decide it is not worthwhile providing information or advertisements to users more than 10  
30 miles away. In this case the distribution parameter defines a uniform area of

---

radius 10 miles centred on the restaurant's location. In an alternative example, for say a motorway service station, the distribution parameter might be for a bigger distance of say 50 miles but only in a narrow direction corresponding to the route of the motorway itself. Hence it will be understood that the expression

5 "parameter" extends to "function" where applicable. It is noted that the service provider means themselves need not in any way be geographically located at the same place as the subject of the information provided by the service provider. It can be seen just from the simple examples of the two types of restaurant described above, that inclusion of the three separate parameters will

10 overall result in an excellent improvement in selectivity of service provision based on a matching of the circumstances of the user and characteristics of the service to be provided. It is also noted that the parameters described enable selectivity based on location, movement and distribution area to be carried out that is not restricted to the geographical delimitation of the cells of the cellular

15 communications system to which the invention is applied.

In the present embodiment the distribution parameter is derived or provided by service provider 130, and transmitted/communicated to processing means 150 via service provider/processing means 160. In alternative cases, cellular

20 communications system means 110 or processing means 150 themselves can derive the distribution parameter for a particular service provider from data gathered in monitoring the area over which the service provider chooses to broadcast its service in the case of broadcast service forms of service provided.

25 Whichever of the above options is implemented, processing means 150 include some form of input means for receiving data related to the area in which service provider 130 wishes to provide service.

The method of the present embodiment comprises the step of determining

30 provision of the service dependent upon the parameters described above,

namely the location parameter, the movement parameter and the distribution parameter. In the present embodiment these parameters are compared by processing means 150, and if the values of the location parameter and the movement parameter are such as to fulfil a pre-determined criteria with respect to the distribution parameter, the decision is made that the service should be provided by service provider 130 to mobile user 120 via service provider/mobile user link 140. The pre-determined criteria is set according to the requirements of the particular service being provided, in a manner such that a required level of confidence and appropriateness of selectivity is achieved, i.e. to a required level of confidence that it will be appropriate or worthwhile for that service to be provided to that user, when the user's location and movement is taken into account compared to the relevant geographical area of the service. In the present case, where the decision is sent to the service provider, when the decision is that the service should be provided, the service provider will thus choose to send the information to the mobile user. Hence, this is an example in which provision of a service has been determined.

In an alternative embodiment the service provider broadcasts on a continual basis over inter-alia service provider/mobile user link 140, and the corresponding decision is that it would be worthwhile for mobile user 120 to choose to tune in to the broadcast, and hence receive the service from service provider 130 via service provider/mobile user link 140. Hence, this is an example in which receipt of a service has been determined.

Whichever of the above options is implemented, processing means 150 include some form of comparison means for comparing the input data. Also, processing means 150 include some form of output means for transmitting data related to the result of its comparison of the input data.

---



In a further alternative embodiment, the location and movement parameters, or even just data from which the parameters can be deduced, are communicated to service provider 130 which itself then determines whether to provide service. In a corollary fashion, in a further alternative the distribution parameter, or at least  
5 data related thereto, is communicated to the mobile station of mobile user 120 which itself then determines whether to receive service.

There are indeed many alternative ways in which the basic method as described above can be implemented, in particular the various parameters can be  
10 determined and processed in different orders, also different possibilities are possible for whether the user initially requests a service (so-called "request" or "pull" mode) or whether a service is continually broadcast (so-called "push" mode). Within each possibility many implementation details are possible. Merely by way of example, one particular "request" embodiment and one  
15 particular "push" embodiment will now be described.

The exemplary "request" embodiment is as shown in Fig. 2. Referring to Fig. 2, function box 210 shows the step of receiving a request for a particular information service from mobile user 120, including a condition to the request  
20 that location appropriateness should be determined by assessment relative to a receipt criteria specified as part of the request by the user. In the present case, the request is initially received by cellular communications system means 110, which passes the request to processing means 150 for determination. Processing means 150 thereafter acquires a location parameter from the user as shown in  
25 function box 220 and a movement parameter from the user as shown in function box 230. Processing means 150 also acquires a corresponding distribution parameter from service provider 130, as shown in function box 250. Processing means 150 then compares the three parameters as shown at function box 250 and calculates whether the above mentioned receipt criteria is fulfilled, as  
30 shown at decision box 260. For the case that the service receipt criteria is indeed

fulfilled, the verified request is passed on from processing means 150 to service provider 130, as shown at function box 270.

The exemplary "push" embodiment is as shown in Fig. 3. Referring to Fig. 3,  
5 function box 310 shows the step of processing means 150 acquiring a distribution parameter from service provider 130, as part of a general instruction to transmit the content of the service to any mobile users fulfilling a service provision criteria that is also provided by service provider 130 to processing means 150. Processing means 150 thereafter acquires a location parameter from  
10 the user as shown in function box 320 and a movement parameter from the user as shown in function box 330. Processing means 150 then compares the three parameters as shown at function box 340 and calculates whether the above mentioned service provision criteria is fulfilled, as shown at decision box 350. For the case that the service provision criteria is indeed fulfilled, processing  
15 means 150 inform service provider 130 that he should indeed provide service to the user, as shown at function box 360.

As mentioned above, Fig. 1 is merely schematic to show the logical interfaces and linkages, and divisions of functions. The exact way in which such functions  
20 and linkages will be implemented will be chosen by the skilled person according to the underlying structure of the cellular communications system to which the invention is being applied. Merely by way of example, one embodiment of such an implementation will now be described.

25 Fig. 4 shows a communications system 400 including user station 120 and a control station 420. In this example, user station 120 represents mobile user 120, and control station 420 consists of a base station system (BSS). A physical communication link established between BSS 420 and mobile user 120 is achieved by a radio link 430. The geographical area served by BSS 420  
30 constitutes one cell of a cellular radio communication system.

---

In the present embodiment BSS 420 is connected to a mobile services switching centre (MSC) 440, which in turn is connected to a public switched telephone network (PSTN) 450. In the present embodiment PSTN 450 is connected to an information network 460, which in the present example consists of the Internet. The present invention is however also applicable to other information networks, including restricted access networks and private networks.

In the present embodiment service provider 130 will provide an information service to a user via the route consisting of information network 460, PSTN 450, MSC 440, control station 420, radio link 430 and mobile user 120. The information, including in multimedia form, is input to the information network via an interface 470. In the present example this interface consists of a modem and the service provider has produced the information content on a computer system.

In other embodiments interface 470 could be coupled directly to PSTN 450 or MSC 440. One scenario in which direct coupling into MSC 440 could occur would be when a particular service provider has a commercial agreement with a particular cellular radio communication network operator having control of or access to MSC 440.

Furthermore it is to be appreciated that the present invention is applicable to other varieties of network configurations and network components, arranged in different hierarchical, access and interconnection formats, in data handling communications systems such as UMTS. As such, the route via which the service provider will provide an information service to a user in other embodiments of the present invention will be chosen by the skilled person according to the particular characteristics of each overall network arrangement, and similarly the location of interface 470 will be chosen according to the

particular characteristics of the overall network arrangement and the nature of the network components.

Similarly, it is to be appreciated that according to the specific network configuration and hierarchies, alternative system components will be incorporated serving different roles compared to control station 420, MSC 440 and PSTN 450. For example, networks such as UMTS ones may incorporate a public data network as opposed to a PSTN, and may incorporate a mobile packet switch as opposed to an MSC. Indeed the invention is applicable to any communication network, including overall networks consisting of sub-networks arranged in parallel and/or superimposed hierarchical logical format, in which a service provider is somewhere inputting a service into the network arrangement and somewhere else in the overall network arrangement is located a user station by which a user will potentially receive the service.

15 In the above described case, processing means 150 are preferably located at MSC 440, but can alternatively be located at other components shown in Fig. 4, at a dedicated remote location, or can be implemented in the form of various different parts distributed at more than one location or component within the overall system. Processing means 150 can be implemented in the form of software running on a suitable processor such as a micro-controller or digital signal processor, or can be implemented in the form of specifically designed electronic hardware or a combination of hardware and software. Furthermore, in the above description, the terminology "cellular communications system means" is to be interpreted as describing any suitable parts of the cellular communications system infrastructure and/or management components that can be arranged to perform the described functions.

### Claims

1. A method of determining provision of a service via a cellular communications system;  
5 the method comprising the step of determining provision of the service dependent upon the following parameters:  
a location parameter related to the location of a user,  
a movement parameter related to the movement of the user, and  
a distribution parameter related to an area in which a service provider wishes to  
10 provide the service.
2. A method of determining receipt of a service via a cellular communications system;  
the method comprising the step of determining receipt of the service dependent  
15 upon the following parameters:  
a location parameter related to the location of a user,  
a movement parameter related to the movement of the user, and  
a distribution parameter related to an area in which a service provider wishes to  
provide the service.  
20
3. A method according to claim 1 or 2, wherein the movement parameter is determined at least from data related to previous locations of a current journey of the user.
- 25 4. A method according to any preceding claim, wherein the movement parameter is determined at least from data related to locations of a previous journey of the user.
5. A method according to any preceding claim, wherein the movement  
30 parameter is determined at least from data related to predetermined routes.

6. A method according to any preceding claim, wherein the movement parameter is determined at least from data related to the location of the user in a time after the location parameter is established.

5

7. A method according to any preceding claim, wherein the user initially requests the service.

8. A method according to any of claims 1-6, wherein the provision or receipt of the service is initiated by the service provider.

10

9. An apparatus for determining provision of a service via a cellular communications system;

the apparatus comprising means for determining provision of the service

15 dependent upon the following parameters:

a location parameter related to the location of a user,

a movement parameter related to the movement of the user, and

a distribution parameter related to an area in which a service provider wishes to provide the service.

20

10. An apparatus for determining receipt of a service via a cellular communications system;

the apparatus comprising means for determining receipt of the service

dependent upon the following parameters:

25 a location parameter related to the location of a user,

a movement parameter related to the movement of the user, and

a distribution parameter related to an area in which a service provider wishes to provide the service.

11. An apparatus according to claim 9 or 10, wherein the movement parameter is determined at least from data related to previous locations of a current journey of the user.
- 5 12. An apparatus according to any of claims 9-11, wherein the movement parameter is determined at least from data related to locations of a previous journey of the user.
- 10 13. An apparatus according to any of claims 9-12, wherein the movement parameter is determined at least from data related to predetermined routes.
14. An apparatus according to any of claims 9-13, wherein the movement parameter is determined at least from data related to the location of the user in a time after the location parameter is established.
- 15 15. An apparatus according to any of claims 9-14, wherein the user initially requests the service.
- 20 16. An apparatus according to any of claims 9-14, wherein the provision or receipt of the service is initiated by the service provider.
17. Processing means for a cellular communications system, comprising:  
input means for receiving data related to the location of a user;  
input means for receiving data related the movement of the user;  
25 input means for receiving data related to an area in which a service provider wishes to provide service;  
comparison means for comparing the input data; and  
output means for outputting data related to the result of comparing the input data.

4  
5  
6

7

8

9

10

11

12

13

14

15

16





16

**Application No:** GB 9907664.8  
**Claims searched:** 1-17

**Examiner:** Anita Keogh  
**Date of search:** 22 September 1999

**Patents Act 1977**  
**Search Report under Section 17**

**Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:  
UK Cl (Ed.Q): H4L (LDPP, LDRRS, LDSHE, LDSHX, LDSL, LDSM, LDSY, LERM)  
Int Cl (Ed.6): H04Q (7/22, 7/38), H04M (11/08)  
Other: Online: WPI

**Documents considered to be relevant:**

Category	Identity of document and relevant passage	Relevant to claims
X	EP 0810803 A2 (SUN MICROSYSTEMS) whole document	1,2,3,4,6,8,9,10,11,12,14,16,17
A	WO 98/59506 A2 (TELIA AB) whole document	
X	WO 98/20698 A2 (QUALCOMM) whole document, particularly page 3 lines 10-37, page 7 lines 11-21, page 10 lines 19-27, page 11 line 19 - page 12 line 15, claims 1 & 2	1,2,3,6,7,9,10,11,14,15,17
X	WO 96/07110 A1 (BT) whole document, especially claims 1,2 & 13	1,2,3,6,7,8,9,10,11,14,15,16,17
X	WO 95/24809 A1 (MOTOROLA) abstract and figure 2	1,2,9,10,17 at least
X	US 5678194 (GRUBE et al.) abstract and column 1 line 62 to column 3 line 60	1,2,9,10,17 at least

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

**THIS PAGE BLANK (USPTO)**